

Stress-dependent generalized Prandtl–Ishlinskii hysteresis model of a NiTi wire with superelastic behavior

ABSTRACT

The extremely useful superelastic behavior of NiTi has been poorly explored because of the limited number of models that can describe the complete hysteretic behavior of NiTi, including a superelastic condition that strongly depends on the applied stress. This paper presents the development of a stress-dependent phenomenological model of NiTi by modifying the existing generalized Prandtl–Ishlinskii (GPI) model. The parameters of the envelop function of the GPI model's play operator are reformulated as quadratic functions of the applied stress. The stress-dependent GPI model can satisfactorily predict the output strain of a NiTi #6 wire under temperature and stress variation.